

The Restriction Requirement

The Examiner asserts that restriction to one of the following inventions is required under 35 U.S.C. § 121:

- I. Claims 1-27, drawn to a process for manufacturing composite parts, classified in class 156, subclass 166; and
- II. Claims 28-49, drawn to a composite material, classified in class 428, subclass unknown.

The Examiner alleges that the inventions are distinct because the product of Group II can be made by a process different from that of Group I, such as by arranging the fibers in a mold and injecting the resin into the mold (OA, p. 2).

Applicants respectfully traverse and, as required by 37 C.F.R. § 1.143, indicates a provisional election of one invention for prosecution, hereby electing the claims of Group I. Prior to the present invention, it has not been possible to exactly position individual long fibers in a desired orientation (*e.g.*, parallel) and in a correctly controlled density within the entire thickness of a composite material of non-planar form (*see, e.g.*, instant specification at page 3, lines 13-18). Moreover, it has also proved challenging to control an initial partial polymerization of a mold to a degree suitable for precise arrangement of long fibers (*see, e.g.*, instant specification at page 3, lines 3-12). Therefore, Applicants assert that efforts to arrange long reinforcement fibers in parallel within a mold followed by simple injection of resin into the mold, as proposed by the Examiner, cannot arrive at the claimed composite material. In fact, it is precisely the discovery of a method to produce high-performance nonplanar composites, which composites have stress-resistant properties comparable to monolithic planar materials, that is at

the crux of the present invention. Accordingly, Applicants respectfully request reconsideration and withdrawal of the restriction requirement in accordance with 37 C.F.R. § 1.143. Applicants hereby preserve their right of petition from requirement for restriction under 37 C.F.R. § 1.144.

35 U.S.C. § 112 Rejections

Claims 2, 3, 4 and 27 have been rejected under 35 U.S.C. § 112, second paragraph; as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention (OA, p. 3). Claim 27 has been canceled thereby obviating the rejection with respect to that claim.

Claim 2 requires that "the surface of the support is developable." In this context, developable means that the surface of the support against which the lengths are stacked can be flattened (*e.g.*, the outer surface of a cylinder). This is described in the specification at page 8, ("Preferable, the surface of the support against which the lengths are stacked is developable; it is easier to make them fit snugly against said surface.") Thus, Applicants maintain that the term "developable" in claim 2 is sufficiently definite.

Additionally, claims 3 and 4 have been amended as suggested by the Examiner to recite that the manufactured composite part has a curvature, and therefore the phrase "minimum radius of curvature" of said composite part now has proper antecedent basis.

In view of the foregoing, Applicants respectfully request that the rejections under 35 U.S.C. § 112 be withdrawn.

35 U.S.C. § 103(a) Rejections

Claims 1-4, 7-9, 12-23 and 27 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 5,609,806 to Walsh et al. ("Walsh") in view of U.S. Patent No. 5,098,496 to Breitigam et al ("Breitigam").

Applicants respectfully traverse. The presently claimed method for manufacturing high-performance nonplanar composite parts is not disclosed by either Walsh or Breitigam. Further, the claimed method would not have been obvious to a person of ordinary skill in the art from the disclosures of the combined references.

The Examiner asserts that Walsh discloses "impregnating thermosetting resin into long parallel reinforcement fibers, partially curing the resin using ultraviolet radiation to form moldable prepegs, forming the prepegs into an article and curing the article" (OA, p. 4). Walsh, however, fails to teach key elements of the claimed method that are critical for manufacturing a nonplanar composite having stress-resistant properties similar to a monolithic material. As admitted by the Examiner, Walsh does not disclose use of a nonplanar support, use of lengths from the precomposite, application by stacking of such lengths to a nonplanar support, or retention of the stack of stressed lengths on a nonplanar support, and further fails to provide any specifics regarding the final molding process (*see* OA, p. 4). Rather, the Examiner postulates that these crucial elements and the motivation or suggestion to combine Walsh with prior art teachings of these elements are found in Breitigam or within the ordinary artisan's experience.

Applicants do not agree. Walsh specifically teaches production of a "B-stage" formable prepeg characterized as a non-dripping paste form of the resin which allows its deformation for molding purposes (*see* Walsh at Column 2, lines 36-51). Notably, however,

Walsh does not bother to consider the reactivity of the prepeg's surface because Walsh merely contemplates molding the B-stage prepeg into the final article (*see* Walsh at Column 2, lines 58-67). Thus, while Walsh may teach that B-stage allows deformation for molding, it does not provide any guarantee to one skilled in the art that the surfaces would offer an excellent ability to bond to a similar surface. Walsh does not indicate that it would be possible to conduct a pre and partial polymerization such that it would remain possible to glue to another similar element without a significant lowering of the mechanical final properties. Therefore, there is no motivation to combine the teaching of Walsh with any teaching on superposing several similar elements.

In direct contrast, the present invention creates and maintains a reactive precomposite surface that enables stacking of precomposites, shaping them into a nonplanar form, and finally curing them into a high performance composite that has properties substantially similar to comparable monolithic planar articles. In fact, bonding together B-stage prepegs taught by Walsh would invariably weaken the mechanical properties of the ultimately molded article, especially since the ability of the surfaces to bond to each other is not regulated and thus unpredictable. Thus, Walsh indeed teaches away from the present invention and cannot, itself or in combination with other references, be read to motivate the skilled artisan to arrive at the present invention.

Interestingly, Breitigam poses the very problem faced by the skilled artisan and addressed by the instant invention. Tellingly, although Breitigam discloses methods for manufacturing non-trivially shaped articles, these methods merely obviate the issue and do not teach how to solve the problem posed. In asserting Breitigam against the presently claimed

invention, the Examiner refers to the background section of Breitigam which states, in relevant part:

Conventional pre-pregable fiber reinforced thermosetting resin articles having non-trivial shapes have been prepared by forming thin sheets of fiber reinforced thermosetting resin in which the resin was partially cured. When non-trivially shaped articles were desired, the thin sheets have been cut into a desired form, stacked to a desired thickness and then formed under thermosetting conditions to complete the cure of the resin and to form an integrated article of the desired non-trivial shape and form (Breitigam at Column 11, lines 40-49).

From this disclosure in Breitigam, the Examiner concludes that:

[I]t is well-known and conventional in the molding arts to form an article by stacking strips of prepreg on a shaped mold and curing them to form an article. It would have been obvious to one skilled in the art at the time the invention was made to mold the preregs of Walsh using the molding technique of the admitted prior art of Breitigam et al. since this is the conventional technique used to mold fiber reinforced resin sheets (Col. 1, ll. 40) particularly since Walsh is forming a prepreg which can be used in conventional processes (OA, pp. 4-5).

However, Breitigam also expressly discloses the shortcomings of the conventional molding art relating to stacking thin sheets of fiber-reinforced thermosetting resin, stating:

Such a process (1) requires many pieces of different and complex equipment, (2) is not a continuous forming operation so it is difficult to have resins which will remain partially cured while they are being passed through the many manipulative steps required to obtain the article having a non-trivial shape and (3) is time-consuming (Breitigam at Column 11, lines 49-55) (emphasis added).

The present invention actually teaches how to solve this problem by joining lengths of precomposite, each having a reactive surface, in a manner that controls the amount of polymerization so as to create a high-performance nonplanar article. On the other hand, the invention taught by Breitigam is a heat hardenable thermosetting composition that is not tightly stacked to a nonplanar support to create the final molded article, thereby of no significance to the present invention.

In reality, by emphasizing the problems facing the skilled artisan when attempting to practice the present invention, Breitigam thereby teaches away from the present invention. Accordingly, Breitigam, itself or in combination with Walsh, fails to provide the necessary motivation, much less teaching, to arrive at the present invention.

The Examiner admits that neither Walsh nor Breitigam teaches the use of a nonplanar support, application of precomposite lengths by stacking of such lengths to the nonplanar support, and formation of a stack of stressed lengths on the nonplanar support, each of which are critical to the claimed invention. Yet, the Examiner contends that:

[O]ne in the art would understand that the prepegs would be fitted snugly against each other to prevent gaps which reduce the strength of the final product, as is known in the art [and] . . . one in the art would appreciate that any type of mold could be used dependent of the intended final product shape, and that it would have been obvious to use a nonplanar mold when forming a nonplanar article (OA, p. 5).

However, the challenge in the prior art has precisely been the inability to produce high-performance nonplanar articles having stress-resistant properties akin to analogous planar monolithic materials.

Furthermore, the Examiner's assertion that it would have been obvious to the skilled artisan to modify the prior art to meet the claimed invention is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the prior art references. *See* M.P.E.P. § 2143.01. In particular, the level of skill in the art cannot be relied upon to provide the suggestion to combine the prior art references. *See Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 U.S.P.Q.2d 1161 (Fed. Cir. 1999); *see also* M.P.E.P. § 2143.01. Therefore, since nothing in any of the cited art suggests modifying Walsh to arrive at the claimed invention, the invention defined by claims 1-4, 7-9, 12-23 and 27 cannot be obvious in view of

Walsh or Breitigam, either alone or in combination. As such, Applicants respectfully request withdrawal of the rejection of claims 1-4, 7-9, 12-23 and 27 under 35 U.S.C. § 103(a).

Claims 5-6 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Walsh and Breitigam, and further in view of U.S. Patent No. 5,439,353 to Cook et al. In light of the above traversal with respect to the rejections over Walsh and Breitigam, Applicants respectfully request withdrawal of the rejection of claims 5-6 under 35 U.S.C. § 103(a).

Claims 10-11 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Walsh and Breitigam, and further in view of U.S. Patent No. 4,433,396 to Armstrong. In light of the above traversal with respect to the rejections over Walsh and Breitigam, Applicants respectfully request withdrawal of the rejection of claims 10-11 under 35 U.S.C. § 103(a).

Claims 24 and 26 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,117,258 to Spragg et al. ("Spragg"), in view of U.S. Patent No. 4,734,144 to Markow ("Markow") and Walsh. In light of the above traversal with respect to the rejections over Walsh, Applicants respectfully request withdrawal of the rejection of claims 24 and 26 under 35 U.S.C. § 103(a).

Claim 25 has been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Spragg, Markow, Walsh, and further in view of U.S. Patent No. 6,248,450 to Voss. In light of the above traversal with respect to the rejections over Walsh, Applicants respectfully request withdrawal of the rejection of claim 25 under 35 U.S.C. § 103(a).

In view of the foregoing remarks, Applicants respectfully request withdrawal of the objections and rejections, and allowance of all the pending claims.

CONCLUSION

A check in payment of the fee for a three-month extension of time is enclosed. Applicants do not believe that any additional fee is required in connection with the submission of this document. However, should any fee be required, or if any overpayment has been made, the Commissioner is hereby authorized to charge any fees, credits or overpayments to Deposit Account 02-4377. Duplicate copies of this sheet are enclosed.

Respectfully submitted,

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Marked-up version of amended claims

3. (Amended) A process according to Claim 1, in which said composite part has a curvature, and in which, considering a minimum radius of curvature "r" of said composite part, the start of prepolymerization is effected in a layer of thickness "e" is such that "e" is smaller than $r/20$.

4. (Amended) A process according to Claim 1, in which said composite part has a curvature, and in which, considering [the] a minimum radius of curvature "r" of said composite part, the start of prepolymerization is effected in a layer of thickness "e" is such that "e" is smaller than $r/150$.

19. (Amended) A process according to Claim 18, in which said monomer is [stirene] styrene.

34. (Amended) A material according to Claim 33, in which said monomer is [stirene] styrene.

45. (Amended) A precomposite according to Claim 44, in which said monomer is [stirene] styrene.